



299-E33-58 (A6866)

Log Data Report REVISED

Borehole Information:

Borehole: 299-E33-58 (A6866)		Site: 216-B-7A Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Not reached		GWL Date: n/a ²	
North	East	Drill Date	TOC³ Elevation	Total Depth (ft)	Type
137388.475	573797.295	May 1947	654.4 ft	153	cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	1.3	8.625	8.0	0.3125	0	153

Borehole Notes:

The casing depth information provided above is from *Hanford Wells* (Chamness and Merz 1993). The nominal 8-in. steel casing size was confirmed by the MACTEC-ERS logging engineer's tape and caliper measurements. Coordinates and top of casing elevation are derived from HWIS⁴.

Logging Equipment Information:

Logging System:	Gamma 1D	Type:	SGLS (35%)
Calibration Date:	07/01	Calibration Reference:	GJO-2001-243-TAR
		Logging Procedure:	MAC-HGLP 1.6.5
Logging System:	Gamma 1C	Type:	HRLS
Calibration Date:	02/02	Calibration Reference:	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4 Repeat	5	6
Date	12/03/01	12/04/01	12/05/01	12/05/01		
Logging Engineer	Musial	Musial	Musial	Musial		
Start Depth (ft)	1.5	31.0	146.0	32.0		
Finish Depth (ft)	32.0	120.0	119.0	47.0		
Count Time (sec)	100	100	100	100		
Live/Real	R	R	R	R		
Shield (Y/N)	N	N	N	N		
MSA Interval (ft)	0.5	0.5	0.5	0.5		
ft/min	n/a	n/a	n/a	n/a		
Pre-Verification	A0048CAB	A0050CAB	A0051CAB	A0051CAB		
Start File	A0049000	A0050000	A0051000	A0051055		
Finish File	A0049061	A0050178	A0051054	A0051085		
Post-Verification	A0049CAA	A0050CAA	A0052CAA	A0052CAA		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2				
Date	02/21/02	02/22/02				
Logging Engineer	Spatz	Spatz				
Start Depth (ft)	30.0	42.0				
Finish Depth (ft)	43.0	56.0				
Count Time (sec)	300	300				
Live/Real	L	L				
Shield (Y/N)	N	N				
MSA Interval (ft)	0.5	0.5				
ft/min	n/a	n/a				
Pre-Verification	A0011CAB	A0012CAB				
Start File	A0011000	A0012000				
Finish File	A0011026	A0012028				
Post-Verification	A0011CAA	A0013CAA				

Logging Operation Notes:

SGLS and HRLS logging were performed during December 2001 and February 2002, respectively. The reference depth for logging measurements is the top of casing. The HRLS was utilized to perform logging in high gamma flux zones, generally where SGLS dead time exceeded 40 percent. A data repeat section was collected in this borehole with the SGLS to measure the logging system's performance.

Analysis Notes:

Analyst:	Henwood	Date:	03/11/02	Reference:	MAC-VZCP 1.7.9, Rev. 2
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This Log Data Report is a revision of the report originally issued 01/15/02. This revision includes high rate data analysis results that were not previously reported and replaces the original Log Data Report.

Pre-run and post-run verifications of the logging systems were performed for each day's log event. Acceptance criteria were not available for the SGLS; however, examination of spectra indicates that the detector functioned normally during the log runs. The photopeak counts per second for the 2614.5-keV, 1461-keV, and 609-keV peaks were consistently slightly lower in the post-run verification spectra when compared to the pre-run verification spectra. However, the log data are provisionally accepted, subject to further review and analysis. Pre- and post-run verifications of the HRLS passed acceptance criteria. The post-verification data were applied to spectra for the energy and resolution calibrations.

A casing correction for 0.322-in.-thick casing is applied for the nominal 8-in. steel casing. This value is within the error of the field measurement collected to confirm casing size and represents the published thickness for ASTM schedule-40 steel pipe (Driscoll 1986), a common borehole casing at Hanford.

Individual spectra were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL using an efficiency function and corrections for casing and dead time as appropriate. EXCEL templates named G1dJul01.xls and G1cFeb02.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead time (> 40%), maximum gross count rates and radionuclide concentrations are not considered reliable, and actual values may be higher than reported values. The HRLS is utilized in zones of high SGLS dead times to quantify the ^{137}Cs concentrations. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 609 keV. The higher energy 1764-keV energy peak exhibits slightly better count rates than the 609-keV peak because of less gamma-ray attenuation caused by the casing in the borehole. In addition, the 609-keV energy peak cannot be distinguished as a result of interference from the ^{137}Cs peak at 662 keV in higher concentration zones.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclide (^{137}Cs) detected in the borehole, naturally occurring radionuclides (^{40}K , ^{238}U , ^{232}Th [KUT]), a combination of man-made, KUT, total gamma and dead time, a plot of total gamma plotted with dead time, and a repeat section plot. Data collected with the HRLS are plotted with the SGLS data where appropriate to provide a continuous record of ^{137}Cs concentrations over 0.5-ft depth intervals. In addition, a comparison plot of ^{137}Cs concentrations derived from the SGLS, HRLS, and Westinghouse Hanford Corporation's Radionuclide Logging System (RLS) is provided.

For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. An upper zone of ^{137}Cs contamination was detected just below the ground surface (log depth 2 ft) with maximum concentration of 19 pCi/g at the 8.5-ft depth. Continuous ^{137}Cs contamination was detected between the depths of 21 and 89.5 ft at concentrations ranging from just above 0.2 pCi/g to a maximum of about 3,600 pCi/g at the 35-ft depth. SGLS dead time exceeded 40 % between 32 and 55 ft, where the calculated concentrations are unreliable and probably slightly under estimated. HRLS data have been collected and substituted at these depths. Between 94.5 and 104.5 ft mostly continuous ^{137}Cs contamination exists at concentrations less than 3 pCi/g. At the 146-ft depth, a single detection of ^{137}Cs contamination occurs at about 0.3 pCi/g.

The RLS ^{137}Cs concentration data, after being decayed from 1992 to 2002, compare favorably with the SGLS and HRLS data. The contaminant profile does not appear to have changed significantly since 1992.

Below the 31.5-ft depth and extending to the bottom of the logged interval, the ^{40}K concentration increases from about 12 pCi/g above 31.5 ft to more than 20 pCi/g. This concentration change suggests a transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

A repeat log section was collected between the 32- and 47-ft depth. The log data show good repeatability for depth and ^{137}Cs concentration but only fair repeatability for KUT concentrations. The full energy peaks for KUT are being affected by the high gamma flux in this interval where higher background and dead time exist. System dead time exceeded 40% over the entire interval, where the calculated concentrations may be slightly under estimated.

References:

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, prepared by Pacific Northwest Laboratory for the U.S. Department of Energy.

Driscoll, F. G., 1986. *Groundwater and Wells*, 2nd Edition, Johnson Filtration Systems, Inc, St. Paul, MN.

¹ GWL – groundwater level

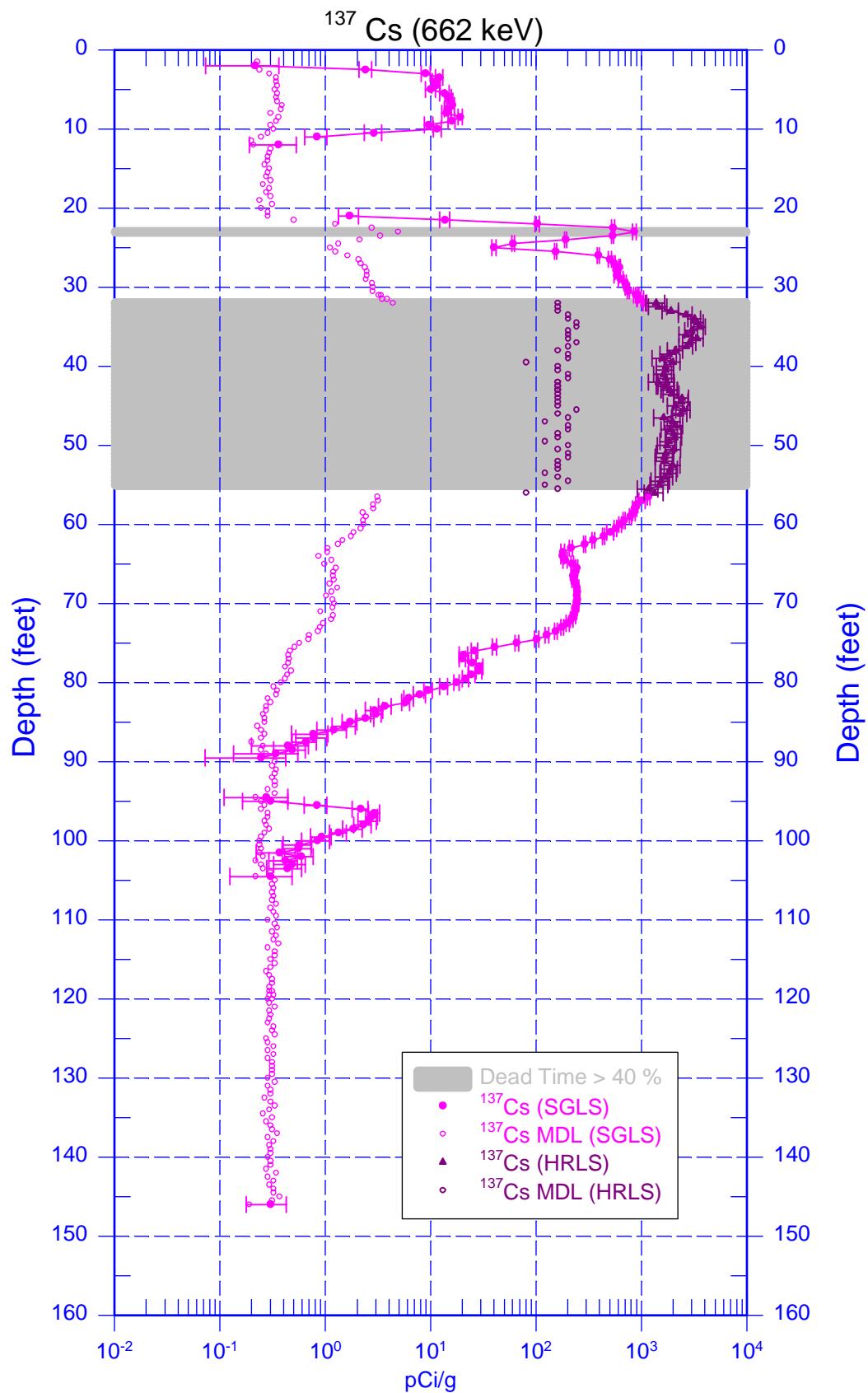
² N/A – not applicable

³ TOC – top of casing

⁴ HWIS – Hanford Well Information System

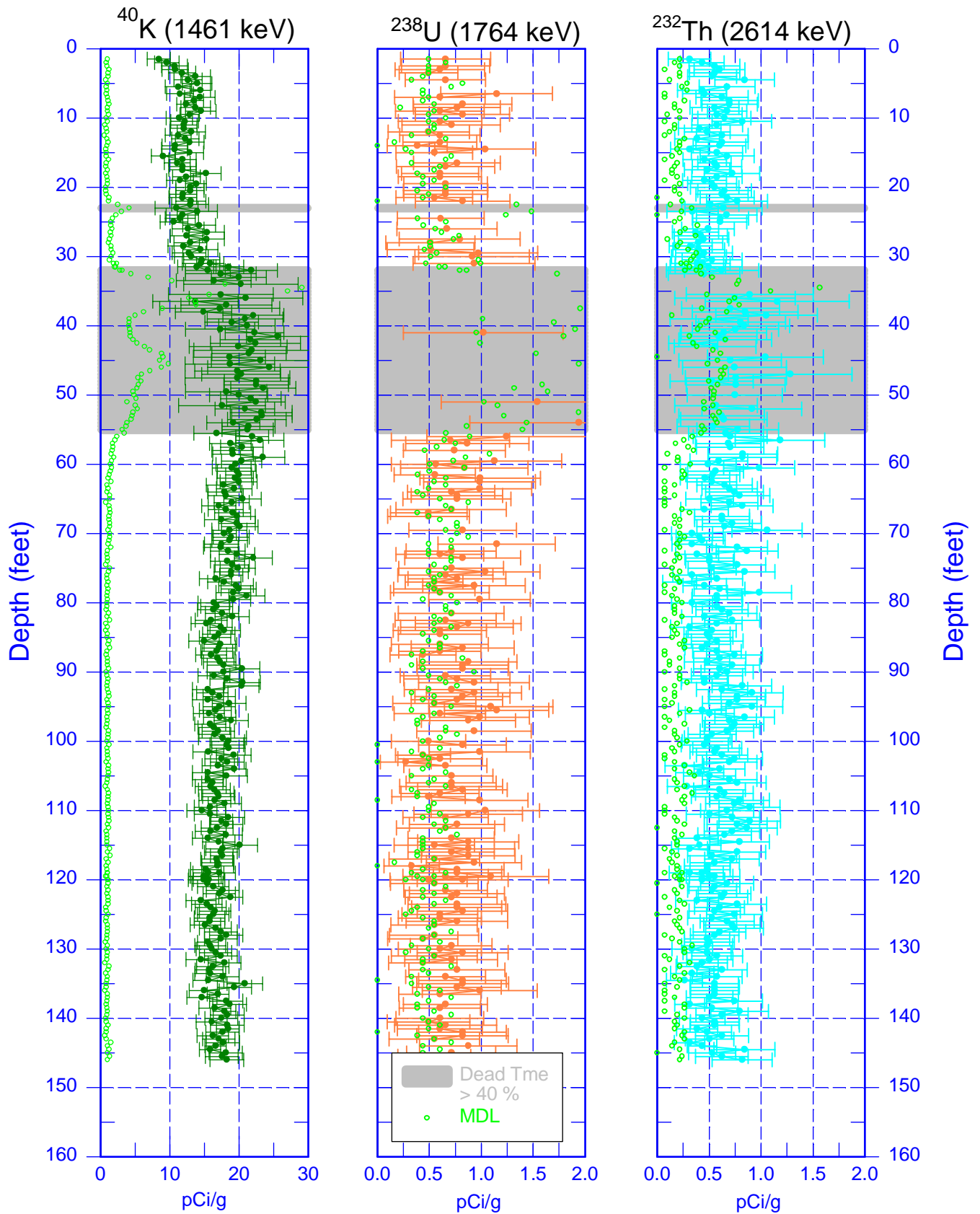
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Man-Made Radionuclide Concentrations

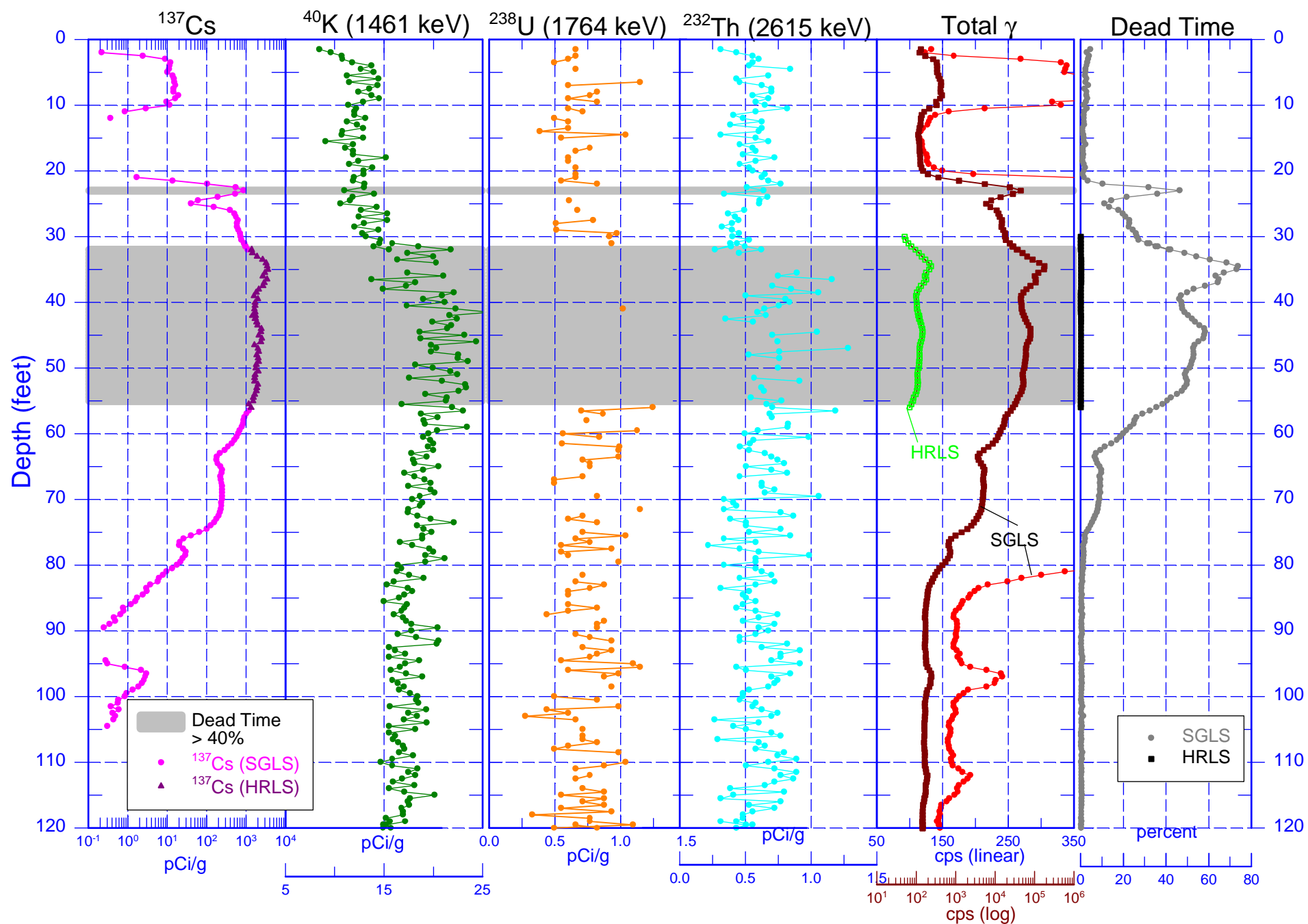


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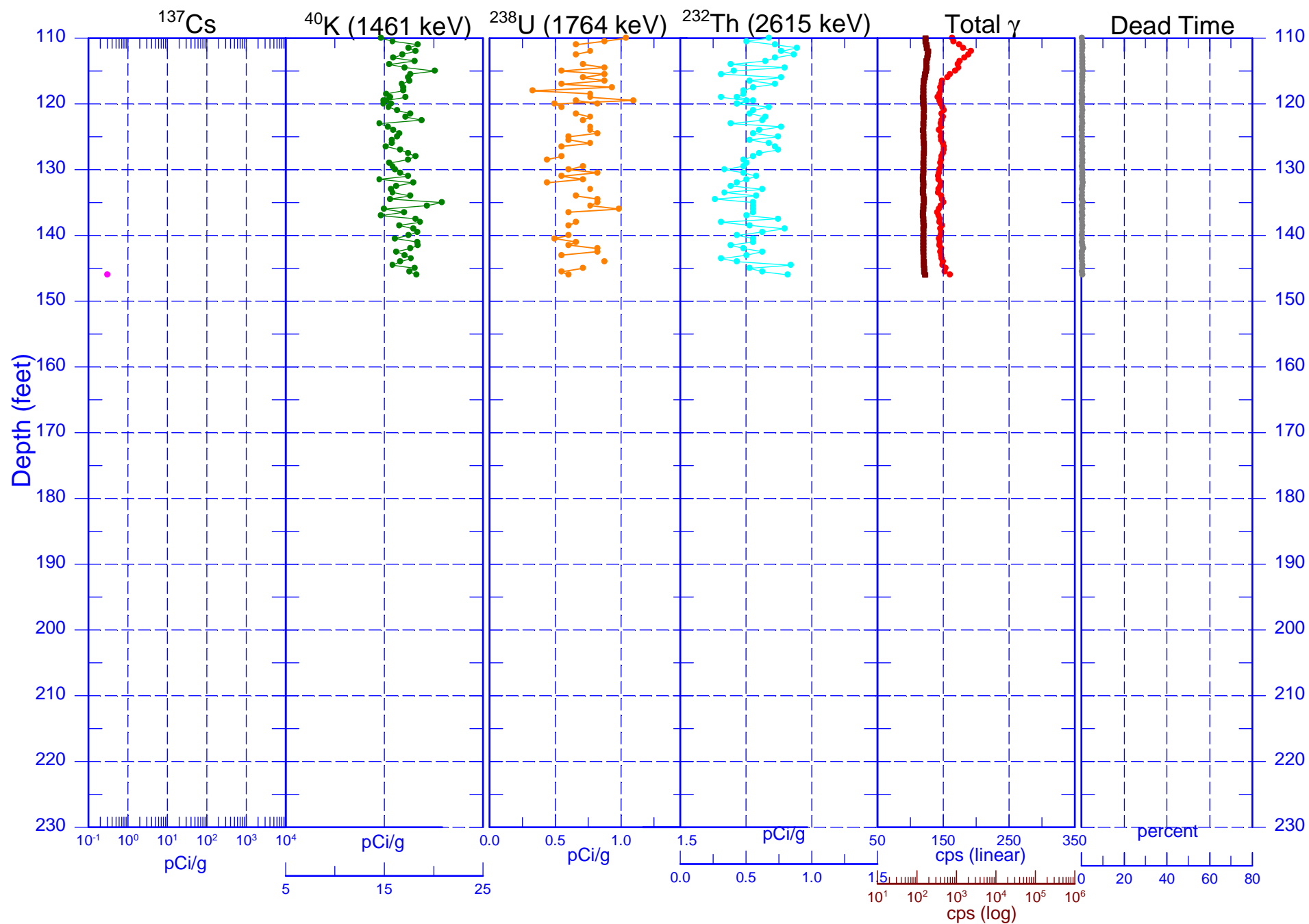
Natural Gamma Logs



299-E33-58 (A6866) Combination Plot

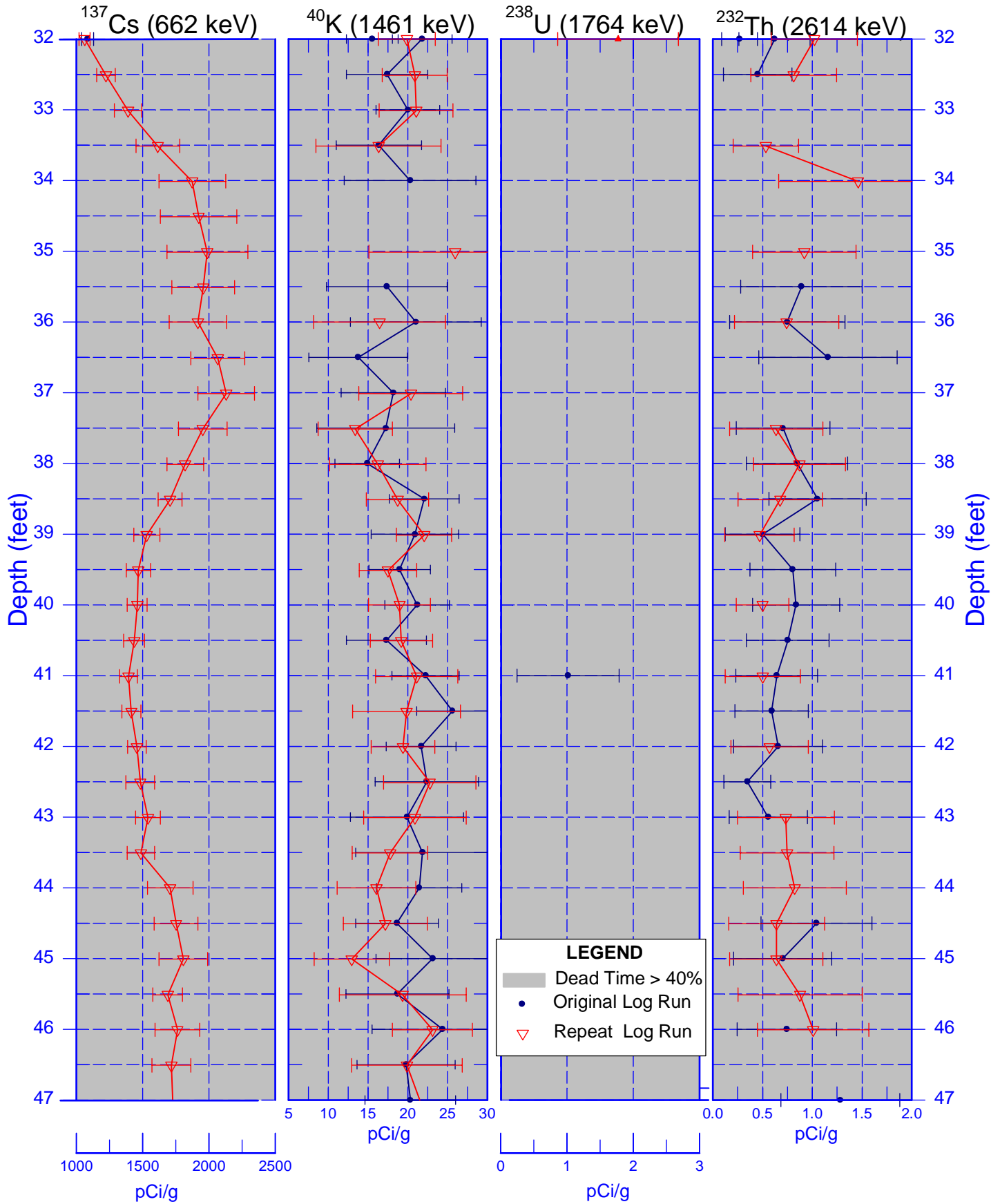


299-E33-58 (A6866) Combination Plot



299-E33-58 (A6866)

Repeat Logs



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RLS, SGLS, HRLS Comparison Log

